

"As entertaining and educational as that organized by the best tour operator."
—CHARLES BURNETT, *New York Times Book Review*



The Beginnings of Western Science

*The European Scientific Tradition in
Philosophical, Religious, and Institutional
Context, Prehistory to A.D. 1450*

SECOND EDITION

DAVID C. LINDBERG

THE MEDICAL TRADITION OF THE EARLY MIDDLE AGES

Medieval medicine was an outgrowth and continuation of the ancient medical tradition (examined above, chap. 6). Medieval medical practitioners were heirs to Greek and Roman theories of health and disease, diagnostic techniques, and therapeutic procedures. But access to this ancient legacy was partial and sometimes precarious, and the portions of it that were available in medieval Islam and Christendom had to be adapted to new cultural circumstances that profoundly shaped their development and use.¹

It is difficult to get a clear picture of early medieval medicine in the West.² The social and economic chaos that accompanied the disintegration of the Roman Empire probably did not seriously affect the craft side of healing—the treatment of wounds and common ailments, midwifery, bonesetting, the preparation and distribution of familiar remedies, and the like. Especially in rural areas and on the domestic front, people skilled in the healing arts continued to practice their craft more or less as local healers had always done. What suffered from Roman collapse was the learned, and especially the theoretical or philosophical, component of medicine. To what extent that meant a loss of health benefits for the European population is unclear. In any case, the decline of schools and the gradual disappearance of facility in Greek increasingly deprived the West of the learned aspects of the Greek medical tradition, so that the number of medical practitioners with a command of the learned traditions of ancient medicine declined precipitously.

This is not to suggest that the West was totally cut off from Greek medical knowledge. Medicine received a certain amount of coverage in early Latin encyclopedias—those of Celsus, Pliny, and Isidore of Seville, for example.³ Moreover, by the middle of the sixth century, a small collection of Greek medical writings was available in Latin translation. But Greek medical literature

covered a broad spectrum of medical interests, from theoretical to practical, and the translated works tended toward the practical. Included were several works by Galen and Hippocrates, a collection of excerpts from Greek medical sources assembled by Oribasius (fl. 4th c. A.D.), a handbook for midwives by Soranus (1st c. A.D.), and the great pharmacopeia (*De materia medica*) of Dioscorides (fl. A.D. 50–70).

The practical, therapeutic orientation of early medieval medicine is nicely illustrated by Dioscorides' *De materia medica* and the pharmaceutical tradition it spawned (fig. 13.1). Containing descriptions of some nine hundred plant, animal, and mineral products alleged to have therapeutic value, Dioscorides' work was one of the monumental achievements of Hellenistic medicine. Translated into Latin in the sixth century, it enjoyed only a limited circulation during the early Middle Ages, perhaps because it was too comprehensive to be useful—containing, as it did, descriptions of many substances unavailable to early medieval Europeans. Far more popular was a shorter, illustrated herbal entitled *Ex herbis femininis*, based on Dioscorides but containing descriptions of only seventy-one medicinal plant substances, all available in Europe. Many additional collections of medical recipes were produced in the course of the early Middle Ages.⁴

Who were the medical practitioners able to make use of these texts? In Italy, the Roman pattern of secular, nonreligious medicine persisted, although it no doubt experienced quantitative decline. Publicly salaried physicians could still be found in early sixth-century Italy under Ostrogothic rule. Alexander of Tralles (a Greek physician) is known to have practiced in Rome in the second half of the sixth century. And a variety of evidence points to the continued existence of lay medical practice at royal courts (for example, that of the Frankish king Clovis at the end of the fifth century) and in major cities (Marseilles and Bordeaux) outside Italy.⁵

But increasingly the most hospitable settings for medical practice seem to have been religious ones, particularly monasteries, where care of sick members of the community was an important obligation. Our earliest evidence comes from Cassiodorus (ca. 480–ca. 575), founder of a monastery at Vivarium, who instructed his monks to read Greek medical works in Latin translation, including the works of Hippocrates, Galen, and Dioscorides (possibly a reference to *Ex herbis femininis*). Other evidence reveals a high level of medical practice, including the use of secular medical literature, in such monastic centers as Monte Cassino, Reichenau, and St. Gall.⁶ It is probable that substantial medical expertise could be found in most monasteries, except the very smallest, throughout the Middle Ages. And although



Fig. 13.1. A page from a Greek manuscript of Dioscorides' *Materia medica*. Paris, Bibliothèque Nationale, MS Gr. 2179, fol. 5r (9th c.).

the medicine practiced within the monastery was intended primarily for members of the monastic community, there is no doubt that on occasion it was made available to others—pilgrims, visitors, and the surrounding population.

The presence, in a monastic environment, of secular medical literature and the medical practices linked with it raises an obvious question, which we must now consider: how did the traditions of Greek and Roman secular medicine interact with Christian ideas about healing? There is no simple answer, but we can begin to make sense of the complex reality if we keep in mind (1) that a philosophical tension *did* emerge between the naturalism of the medical tradition (the assumption that only natural causes are at work) and supernaturalist traditions (miraculous healing) within Christianity; (2) that most people (including literate people) were not philosophically inclined, and therefore few ever noticed the tension; and (3) that for those who did, there were various ways of easing or resolving the tension, short of repudiating one kind of healing or the other.

The sources of tension are obvious enough. As medieval Christianity matured, it became common for sermons and religious literature to teach that sickness is a divine visitation, intended as punishment for sin or a stimulus to spiritual growth. The cure, in either case, would seem to be spiritual rather than physical. Moreover, medieval Christianity developed a widespread tradition of miraculous cures, associated especially with the cult of saints and relics. And to complete the picture, we have the concrete evidence of religious leaders denouncing secular medicine for its inability to produce results.⁷

It is fairly easy to inflate such beliefs and attitudes into a general portrayal of the Christian church as an implacable opponent of Greek and Roman medicine, resolutely committed to belief in supernatural causation and to the exclusive use of supernatural remedies. Unfortunately, such attempts seriously misrepresent the historical reality. Although it is true that sickness was widely understood to be of divine origin, this did not rule out natural causes, for most medieval Christians shared the view, common since the Hippocratic writers, that an event or a disease could be simultaneously natural and divine (see above, chap. 6). Within a Christian context, it made perfectly good sense to believe that God customarily employs natural powers to accomplish divine purposes. For example, plague could be explained both as divine retribution for sin and as the result of an unfavorable conjunction of planets or corruption of the air.⁸ As for the practice of medicine and the use of natural remedies, all Christian writers would have agreed that cure of the soul is more important than cure of the body, and a few spoke out against any use of secular medicine. Bernard of Clairvaux (1090–1153), writing to a group of monks in the twelfth century, expressed views that had existed for centuries:

I fully realize that you live in an unhealthy region and that many of you are sick. . . . It is not at all in keeping with your profession to seek

for bodily medicines, and they are not really conducive to health. The use of common herbs, such as are used by the poor, can sometimes be tolerated, and such is our custom. But to buy special kinds of medicines, to seek out doctors and swallow their nostrums, this does not become religious [i.e., monks].⁹

But the vast majority of Christian leaders looked favorably on the Greco-Roman medical tradition, viewing it as a divine gift, an aspect of divine providence, the use of which was legitimate and perhaps even obligatory. Basil of Caesarea (ca. 330–79) spoke for many of the church fathers when he wrote that “we must take great care to employ this medical art, if it should be necessary, not as making it wholly accountable for our state of health or illness, but as redounding to the glory of God.” Even a writer as hostile to Greco-Roman learning as Tertullian (ca. 155–ca. 230) revealed his appreciation of the value of Greco-Roman medicine. The denigrating accounts of conventional medicine that appear in saints’ lives served an obvious polemical function—namely, to authenticate and magnify the power of the saint in question by demonstrating how he or she had healing abilities that transcended those of the secular healer. That we cannot take such denunciations as representative of the views of the author (let alone the remainder of medieval society) toward secular medicine is evident from the fact that many of these same authors, in other contexts or even in the same context, reveal a large measure of respect for conventional healing practices. What the church fathers were eager to denounce was not the use of secular medicine, but the tendency to overvalue it and the failure to recognize and acknowledge its divine origin.¹⁰

While defending the church against the charge of having repudiated the medical tradition, we must be careful to avoid the opposite error. There is no question that early medieval Christians believed in healing miracles and that they availed themselves of both religious healing and secular medicine, sometimes simultaneously, sometimes sequentially (fig. 13.2). In the fourth and fifth centuries the cult of saints became a dominant feature of European culture. Shrines were established around the tomb or some relic (perhaps a bone) of a saint; and these became pilgrimage sites of enormous drawing power. One of the features of these sites that contributed most powerfully to their attraction was the report of miraculous cures produced there. A single example will serve to illustrate: Bede (d. 735), in his *Ecclesiastical History of the English People*, recounted many stories of miraculous healings, including that of a monk on the island of Lindisfarne (off the northeastern



Fig. 13.2. The miraculous healing of a leg. Paris, Bibliothèque Nationale, MS Fr. 2829, fol. 87r (late 15th c.). For discussion of this illustration, see Marie-José Imbault-Huart, *La médecine au moyen âge à travers les manuscrits de la Bibliothèque Nationale*, p. 182.

coast of England), suffering from palsy, who was brought to the tomb of Cuthbert:

falling prostrate on the corpse of the man of God, he prayed with godly earnestness that through his help the Lord would become merciful unto him: and as he was at his prayers, . . . he felt (as he himself was afterwards wont to tell) as though a great wide hand had touched his head in the place that suffered and with that same touch placed pressure on all parts of the body that had been sore vexed with sickness; and little by little the pain receded and health returned all the way down to his feet.¹¹

Similar tales from the medieval period could be multiplied without end.

If the church was neither the enemy of the Greco-Roman medical tradition nor its single-minded supporter, how are we to characterize its attitude and influence? A familiar approach would be to weigh the factors on each side of the equation—both the opposition and the support offered by the church—and to argue that on balance the church was a force for good or

ill, as the case might be. But such a conclusion would be simplistic. We will come closer to the truth if we avoid the categories of opposition and support altogether and see the church as a powerful cultural force that interacted with the secular medical tradition, appropriating and transforming it. Churchmen neither simply repudiated nor simply adopted secular medicine, but put it to use; and to use it was to adapt it to new circumstances, thereby subtly (or, in some respects, radically) altering its character. It is not too strong to claim that within Christendom there was a fusion of secular and religious healing traditions. In its new context, Greco-Roman medicine would have to be accommodated to Christian ideas of divine omnipotence, providence, and miracles. In the radically new institutional setting provided by the monasteries, it was not only nurtured and preserved through a dangerous period in European history, but it was also pressed into service on behalf of Christian ideals of charity (one important outcome of which was the development and spread of hospitals). And eventually, its institutionalization in the universities restored its contact with various branches of philosophy and elevated its status as a science.

One further development of critical importance requires our attention before we leave the early medieval period. The translation of Greek medical works into Arabic began in the eighth century and continued through the tenth. When it was finished, most of the major Greek medical sources were available in Arabic, including Dioscorides' *De materia medica*, many Hippocratic works, and nearly all the works of Galen. The magnitude of the gap between Islamic and Western access to this Greek medical literature can be illustrated by reference to the Galenic corpus: only two or three of Galen's works were available in Latin before the eleventh century, whereas Hunayn ibn Ishāq (808–73) listed 129 Galenic works known to him in Baghdad, 40 of which he claimed to have personally translated into Arabic.

This Greek medical literature served as a foundation on which a sophisticated Islamic medical tradition would be built (see above, chap. 8). Several features of this medical tradition require brief mention. First, Islamic medicine was built on a full mastery of Greek medical literature and an assimilation of many of the aims and much of the content of Greek medicine. Second, central to the medical thought that emerged were Galenic anatomy and physiology and Galenic theories of health, disease (including epidemic disease), diagnosis, and therapy. An important aspect of Galenic influence was the linkage it revealed between medicine and philosophy—a linkage that became characteristic of much Islamic medical thought.

Third, Galenic medical theory did not rigidly constrain medical thought and practice in Islam, but functioned as a framework to be extended,

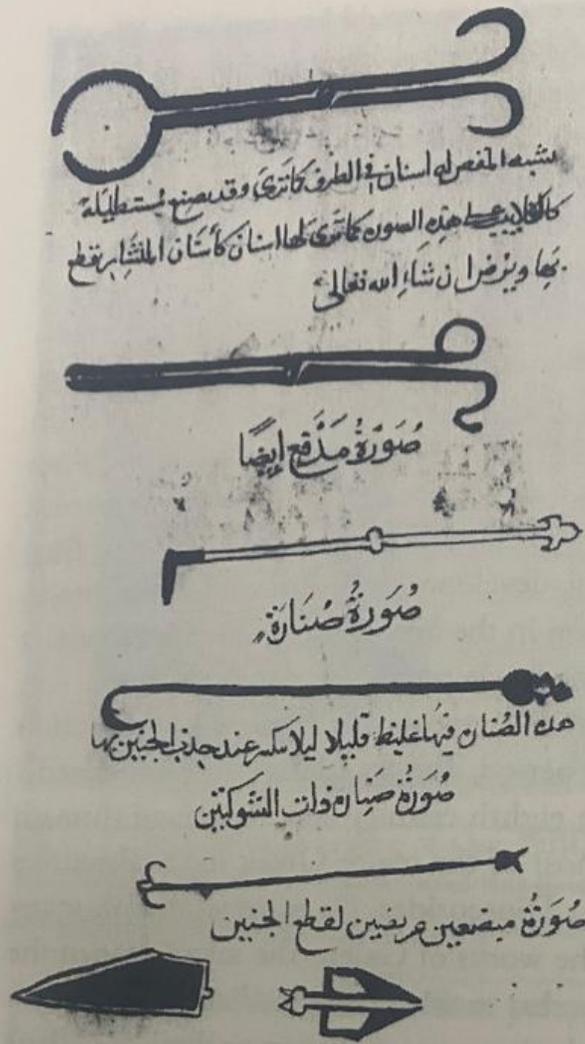


Fig. 13.3. Arabic surgical instruments from the treatise by Abū al-Qāsim al-Zahrāwī (Abulcasis), *On Surgery and Instruments*. Oxford, Bodleian Library, MS Huntington 156, fol. 85v.

modified, and integrated with other medical and philosophical systems; medicine in Islam was a dynamic, rather than a static, enterprise. Fourth, not only did Greek medical works circulate in translation, but along with them a large native medical literature was produced by Islamic physicians. This original Arabic literature contained a great deal of variety, of course, but particularly prominent was a series of comprehensive, encyclopedic works that surveyed large segments, or even the whole, of medical theory and practice. Three such encyclopedic works that were to have a profound influence on later Western medicine (see above, chap. 8) were the *Almansor* of Rhazes (al-Rāzī, d. ca. 930), the *Pantegni* (or *Universal Art*) of Haly Abbas (‘Alī ibn ‘Abbās al-Majūsī, d. 994), and the *Canon of Medicine* of Avicenna (Ibn Sīnā, 980–1037). These, along with many other translated works, helped to shape and redirect Western medicine in the later Middle Ages.¹²

THE TRANSFORMATION OF WESTERN MEDICINE

In the eleventh and twelfth centuries, a number of influences began to impinge on the European medical tradition and alter its character. The political and economic renewal of the period, accompanied by dramatic population increase, led to far-reaching social change, including the urbanization and expansion of educational opportunity. In the new urban schools the curriculum was broadened, as emphasis came to be placed on subjects that had been of minor significance, or even totally absent, in the monastic setting. Meanwhile, reform movements within monasticism were attempting to diminish monastic involvement in secular culture (see above, chap. 9). The convergence of these movements brought about a shift in the location of medical education from the monasteries to the urban schools, with a corresponding shift toward professionalization and secularization. At the same time there was a growing demand among urban elites for the services of skilled medical practitioners, which contributed to the emergence of medical practice as a lucrative (and sometimes prestigious) career.

The earliest example of renewed urban medical activity is at Salerno, in southern Italy, in the tenth century. By the end of the century, Salerno had acquired a reputation for its numerous and skilled medical practitioners, including clergy and women. There seems to have been no school in any formal sense, but simply a center (increasingly a famous center) of medical activity, with ample opportunities for men and women to master the healing arts through apprenticeship. What flourished at Salerno in the tenth century and into the eleventh was not medical learning but skill in the healing arts. In the course of the eleventh century, some of the practitioners at Salerno began to produce medical writings of a practical sort. Early in the twelfth century, the literature emanating from Salerno began to broaden and become more theoretical, reflecting the philosophical orientation of the Arabic medical texts beginning to circulate in Latin translation. Many of the new texts were teaching texts, connected (apparently) with the emergence of organized medical instruction at Salerno.¹³

The translations from the Arabic that influenced medical activity at Salerno in the twelfth century soon transformed medical instruction and medical practice throughout Europe. The earliest translations appear to have been those of Constantine the African (fl. 1065–85), a Benedictine monk at the monastery of Monte Cassino in southern Italy, who had close ties with Salerno (fig 13.4). Constantine, whose knowledge of Arabic was



Fig. 13.4. Constantine the African practicing urinalysis. Oxford, Bodleian Library, MS Rawlinson C.328, fol. 3r (15th c.). For commentary, see Loren C. MacKinney, *Medical Illustrations in Medieval Manuscripts*, pp. 12–13.

undoubtedly connected with his north African origins, translated works of Hippocrates and Galen, the *Pantegni* of Haly Abbas, medical works by Hunayn ibn Ishāq, and other sources. He was followed by other translators over the next 150 years, in southern Italy, Spain, and elsewhere, who little by little rendered from Arabic to Latin much of the corpus of Greco-Arabic medicine. At Toledo, Gerard of Cremona (ca. 1114–87) translated nine Galenic treatises, Rhazes' *Almansor*, and Avicenna's great *Canon of Medicine*. These new texts vastly broadened and deepened Western medical knowledge, giving it a much more philosophical orientation than it had possessed during the early Middle Ages and ultimately shaping the form and content of medical instruction in the newly founded universities.¹⁴

MEDICAL PRACTITIONERS

Today we generally think of medicine as a learned profession, which can be practiced only by those who have undergone a long period of schooling and acquired appropriate professional credentials. But if we project such a model

onto the Middle Ages, we will be sorely misled. A far more useful modern analogue would be carpentry. Carpentry covers a continuum from elementary home maintenance through the professional carpentry of the building trades to civil engineering and architecture. Carpentry of the simplest kind falls into the realm of general knowledge (almost everybody knows, or is willing to learn, something about elementary home repair); the weekend amateur, who (for example) restores antiques for a hobby, may command considerable knowledge and skill; the building trades are staffed by expert professionals who have, for the most part, learned their trade through apprenticeship; and finally, the civil engineer and the architect bring theoretical knowledge to bear on the subject.

So it was with the practice of medicine in the Middle Ages. Simple domestic medicine, practiced in the home, was the property of almost everybody. If more expertise was required, every community had people known to have a knack for treating certain kinds of ailments, and we begin here to move up the ladder of medical expertise and specialization. Most villages would have midwives, bonesetters, and people knowledgeable in herbs and herbal remedies. In the cities, one would find a variety of "empirics" with such specialties as the treatment of wounds, dental problems, and certain kinds of surgery (for example, lancing boils, repair of hernia, or removal of kidney stones). At a higher level of professionalization were apothecaries, trained surgeons, skilled professional medical practitioners educated through apprenticeship, and finally university-educated physicians. This was by no means a static or strictly linear hierarchy, nor was it invariable from place to place; it was also complicated by the existence of both secular and religious practitioners (clerics, for example, who frequently combined conventional medical practice with religious duties) at many of the levels; moreover, the lines of demarcation were rarely clear, because the regulation or licensing of medical practitioners, which would have demanded relatively clear categories, was only slowly instituted in the course of the later medieval period and never became universally effective. But some semblance of this classification scheme was generally characteristic of the medieval medical scene.¹⁵

We have only the sketchiest data on the numbers of medical practitioners in medieval Europe. We can learn something, however, from the fragments of data in our possession. In 1338, Florence (which was undoubtedly blessed with far more physicians per capita than the average European city) had approximately 60 licensed medical practitioners of all kinds (including surgeons and unlettered "empirics") for a population of 120,000. Twenty years later, after the population had been decimated by the black death, Florence had

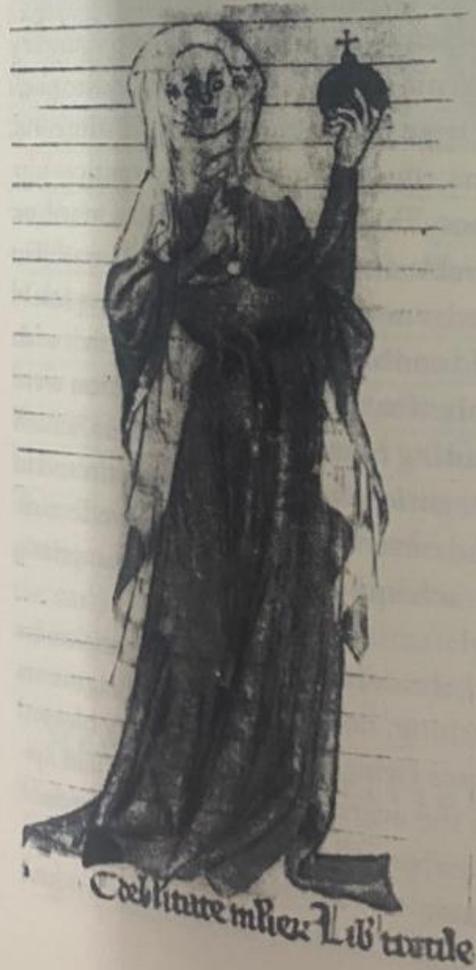


Fig. 13.5 (above). Fetuses in the womb. Copenhagen, Kongelige Bibliotek, MS Gl. kgl. Saml. 1653 4°, fol. 18r (12th c.).

Fig. 13.6 (left). Trotula, a twelfth-century Salernitan medical practitioner. London, Wellcome Institute Library, MS 544, p. 65 (12th c.).

56 licensed medical practitioners for a population of about 42,000; and this ratio of 12 or 13 physicians for every 10,000 residents held for the remainder of the century.¹⁶ Access in rural areas to a trained physician must have been far less common. Included among medieval medical practitioners were substantial numbers of women, active in obstetrics and gynecology but also in other medical specialties. The most famous of these is Trota or Trotula, from twelfth-century Salerno, who may not have written the gynecological work usually attributed to her but seems to have produced a more general work of practical medical remedies and advice. In certain parts of Europe Jewish medical practitioners were also numerous.¹⁷

MEDICINE IN THE UNIVERSITIES

The medical practitioners about whom we know the most are those who studied or taught in the formally organized medical schools of medieval Europe. Because these physicians were literate and left written records that have survived, we can learn something about their identities, their studies, and the kind of medical practice in which they engaged.¹⁸

Formal medical studies seem to have appeared first in the cathedral schools of the tenth and eleventh centuries—not for the purpose of educating professional physicians, but as an aspect of general education. At Chartres, for example, medical studies appeared by about 990, and in the next century medical instruction could be found in similar schools elsewhere.¹⁹ However, it was at Salerno in the twelfth century that the newly translated medical works of the Greco-Arabic tradition were first assimilated, and it was there that medicine began to emerge as a learned profession. The driving force behind these developments was not mere intellectual curiosity or medical altruism (though a measure of both no doubt existed), but the desire for status and professional advancement. Physicians already at the top of the medical hierarchy outlined above, and therefore already literate, perceived the possibility of elevating their status by imitating other learned professions, such as law, in demanding that practitioners acquire appropriate formal credentials. The aim was to elevate the status of medicine from art or craft to science. Developments at Salerno were influential, and in the thirteenth century medical faculties became prominent at the universities of Montpellier, Paris, and Bologna. Medical faculties of lesser significance were created at Padua, Ferrara, Oxford, and elsewhere.

The institutionalization of medicine in the medieval universities was of enormous importance for the course of medical theory and practice. In the

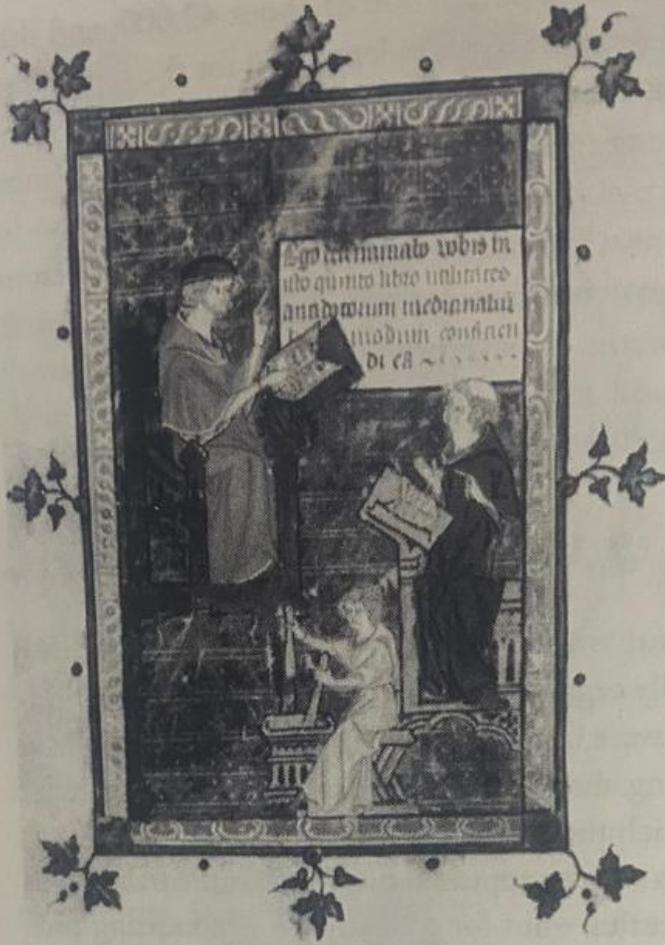


Fig. 13.7. Medical instruction. From a copy of Avicenna's *Canon of Medicine*, Paris, Bibliothèque Nationale, MS Lat. 14023, fol. 769v (14th c.).

first place, it assured the continuation and the continuity of medical studies and the existence, from the Middle Ages to the present, of an influential community of university-educated physicians. Second, the establishment of medical studies in the university (as opposed to some other possible institutional home) created a linkage between medicine and other branches of knowledge that profoundly shaped the development of medicine. Specifically, a degree in the faculty of arts came to be a typical (if not quite universal) prerequisite for medical studies; and this meant that medical students came equipped with the logical and philosophical tools that would transform medicine (for better or for worse) into a rigorous, scholastic enterprise. It also gave medicine access to Aristotelian natural philosophy, which would provide medicine with some of its important principles, and to astrological theory (and its companion, astronomy), which would become a universal part of the physician's diagnostic and therapeutic armory. Let us give the medical curriculum a brief examination.

Teaching, first at Salerno and later in the other medical schools, coalesced, for a time, around a collection of brief treatises known collectively as the *Articella*.

This collection included an introduction to medicine by Ḥunayn ibn Ishāq (known in the West as Johannitius), several short works from the Hippocratic corpus, and books on urinalysis and diagnosis by pulse. In the fourteenth and fifteenth centuries, these were supplemented by the works of Galen, Rhazes, Haly Abbas, Avicenna, and others. This curriculum had a marked philosophical orientation—medical theory being required to conform to broader principles of natural philosophy. And the teaching methods employed were the typical scholastic ones of commentary on authoritative texts and debate over disputed questions. But that did not mean (as has sometimes been alleged) that university medicine was a purely theoretical, textbook activity. In fact, many university professors of medicine engaged in private practice on the side, and medical students were frequently required to obtain practical experience.²⁰

Finally, do we have any idea of the numbers of students involved? We do have scraps of relevant data. During a period of fifteen years early in the fifteenth century, the University of Bologna (one of the foremost medical schools in Europe) granted sixty-five degrees in medicine and one in surgery. During a thirty-six-year period a little later in the same century, the University of Turin (also in northern Italy) awarded a total of thirteen medical doctorates. And during its first sixty years of existence (beginning in 1477) the University of Tübingen awarded medical degrees at the rate of about one every other year. The number of medical students, of course, was far higher than the number of degree recipients, since most students did not complete the course of studies: the ratio 10:1 has been suggested as a possible multiplier. About all we learn from these numbers is that university-trained physicians, and especially physicians with doctorates in medicine, were rare creatures, members of an urban elite and accessible, for the most part, only for the rich and powerful.²¹

DISEASE, DIAGNOSIS, PROGNOSIS, AND THERAPY

The medical theories held and the diagnostic measures and therapies employed by a medieval medical practitioner varied with the practitioner's level of education, specialty, and professional circumstances. We know most, of course, about the views and procedures of learned physicians; but we have reason to believe that their beliefs and practices filtered downward and therefore influenced other kinds of healers. For example, we have ample evidence that Latin medical treatises were translated into vernacular languages, or translated

and excerpted, for the benefit of medical practitioners who were literate but could not read Latin.²² At the same time, it is clear that folk medicine and folk remedies had a tendency to filter upward and influence professional and even (to some extent) learned medicine. We will not be far off, therefore, if we judge the following elements of medical belief and practice to have been present, to varying degrees, in much medieval healing activity.

Fundamental to medieval theories of disease was the idea that every person has a characteristic complexion or temperament, determined by the balance of the four elements and their corresponding qualities (hot, cold, wet, dry) in the person's body. It was understood that complexion was peculiar to the individual; the balance that was normal for one would be abnormal for another. Closely associated with the theory of complexion was the idea, stemming from Galen and the Hippocratics, that the body contains four principal, physiologically significant fluids or humors—blood, phlegm, black bile, and red or yellow bile—and that these humors are the vehicles by which the proper balance of qualities is maintained. It was understood that health is associated with proper balance, illness with imbalance. For example, fever was conceived to be the result of abnormal heat emanating from the heart. Finally, health and disease were thought to be influenced by a set of conditions called the "nonnaturals": the air breathed, food and drink, sleep and wakefulness, activity and rest, retention and elimination (of nutrients), and state of mind.²³

If sickness is the result of deviation from a person's normal complexion, then therapy must be directed toward the restoration of balance. Various techniques were available for the achievement of this end. The first was dietary; since the humors are the end products of the food consumed, a suitable diet was absolutely essential to the maintenance of health. Drugs, classified according to their predominant qualities, could also be prescribed to help restore balance. And if more heroic treatment seemed called for, it was possible to eliminate excess bodily fluids through purging, "puking," and bloodletting. In order to determine which of these measures to employ, the physician would need to inquire into the patient's lifestyle or regimen (such matters as diet, exercise, sleep, sexual activity, and bathing) in order to ascertain his or her specific complexion and the regimen required to maintain it. Indeed, for maximum effect the physician should closely monitor the patient's activities over an extended period of time—a realistic aim only for a physician (presumably learned) in the employ of a wealthy patron. Having observed his patron-patient over a period of time, the learned physician would (in theory) be in a position to offer the advice needed for the maintenance or recovery of health. The ideal that governed learned medicine (and, to some extent, less



Fig. 13.8. An apothecary shop. London, British Library, MS Sloane 1977, fol. 49v (14th c.). By permission of the British Library.

learned varieties of medical practice) thus portrayed the physician as medical advisor, with a primary responsibility for what we would call preventive medicine, but capable of following up with suitable remedies when preventive measures failed.²⁴

The most common form of medical intervention was drug therapy, and the ability to identify and prepare drugs, along with knowledge of their therapeutic properties, was therefore an essential part of the repertory of most medieval healers. Drugs could be simple or compound; the most common ingredients were herbal, but animal and mineral substances were also employed. Many drugs were folk remedies, sanctioned by apparently successful use over many generations. For example, long experience had taught local healers that certain plant substances were effective as laxatives or painkillers. There is no question that some medieval drugs were effective; the majority, however, were simply harmless, while a few may have been dangerous. And some were downright disgusting—for example, the belief that pig manure was an effective cure for nosebleed. In this case, the cure might well seem worse than the ailment.²⁵

But if there was a substantial empirical (frequently folk) component in medieval drug therapy, there was also a strong theoretical component emanating from the Greek and Arabic medical traditions. Dioscorides' *De materia medica* (in a revised and augmented version) had a very modest circulation in the West; in the twelfth century, new and more influential collections of medical recipes appeared; and finally, fresh translations of works by Galen, Avicenna, and others supplied the theoretical underpinnings needed to organize and systematize pharmaceutical knowledge. The basic theoretical assumption (borrowed, undoubtedly, from Galen) was that natural substances have therapeutic properties, associated with their primary qualities: hot, cold, wet, dry. To this theory, Avicenna added the idea that medicinal substances may also have a "specific form," independent of their primary qualities, which explains therapeutic effects not readily accounted for by the four primary qualities. It was thus through its specific form that theriac (a drug known since antiquity, made from viper's flesh and other ingredients) acquired the remarkable curative properties assigned to it in the twelfth-century *Antidotarium Nicolai*:

Theriac . . . is good for the most serious afflictions of the entire human body: against epilepsy, catalepsy, apoplexy, headache, stomach ache, and migraine; for hoarseness of voice and constriction of the chest; against bronchitis, asthma, spitting of blood, jaundice, dropsy, pneumonia, colic, intestinal wounds, nephritis, the stone, and cholera; it induces menstruation and expels the dead fetus; it cures leprosy, smallpox, intermittent chills, and other chronic ills; it is especially good against all poisons, and the bites of snakes and reptiles . . . ; it clears up every failing of the senses[?], it strengthens the heart, brain, and liver, and makes and keeps the entire body incorrupt.²⁶

Another area of theoretical concern was the problem of determining how the properties of compound medicines depended on the qualities of their simple ingredients. Elaborate theoretical discussions (including mathematical analysis) of this problem were undertaken by both Islamic and European authors. Indeed, the doctrines of the intensification of the qualities of

pulse and one on urine, contained in the *Articella* collection, as well as longer discussions in Avicenna's *Canon of Medicine*, assured their centrality in later medieval diagnosis. It was held that urinalysis could reveal the state of the liver, while pulse reflected the state of the heart. The critical features of the urine were color, consistency, odor, and clarity. For example, an early thirteenth-century medical writer, Giles of Corbeil, maintained that "thick urine, whitish, milky, or bluish-white, indicates dropsy, colic, the stone, headache, excess of phlegm, rheum in the members, or a flux."²⁸ Charts revealing the connection between different colors of urine and various ailments were a common feature of medieval medical writing (see fig. 13.9).

In taking a patient's pulse, the physician attempted to determine its strength, duration, regularity, breadth, and so forth (fig. 13.10). Many varieties of pulse were differentiated and various classification schemes developed. An anonymous treatise of the thirteenth century offered the following scheme:

The varieties of pulses are differentiated by the physician in a number of ways, in particular according to five considerations: (1) motion of the arteries; (2) condition of the artery; (3) duration of diastole and systole; (4) strengthening or weakening of pulsation; (5) regularity or irregularity of the beat. Ten varieties of pulse derive from these considerations.²⁹

Failing pulse could be used to foretell the time of death and was therefore useful for prognosis as well as diagnosis.

Thus far we have sidestepped one pervasive element in medical theory and practice, which hovered over and shaped what the medieval healer believed and the therapeutic measures that he or she prescribed. This was medical astrology, which harbored the belief that planetary influence is implicated in both the cause and the cure of disease. There were good reasons for believing in such planetary influence. One was medical authority: several of the Hippocratic works contained passages that could be interpreted as affirmations of celestial influence, and during the later Middle Ages a treatise on astrological medicine circulated under Hippocrates' name. But far more importantly, anybody who had grasped the fundamentals of natural philosophy, as we have seen above, knew that the heavens exercised an influence on the human body and its environment; and there was no reason at all to doubt that this would have an effect on health and the course of disease (fig. 13.11).³⁰

Celestial influence began at conception, contributing to the temperament or complexion of the newly conceived embryo. After birth, every human was

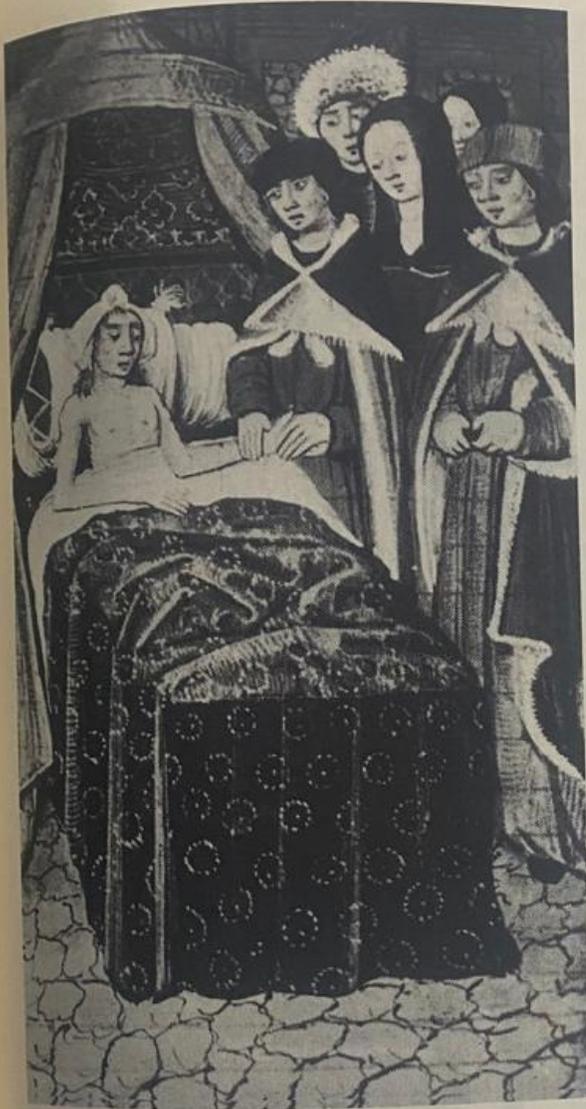


Fig. 13.10. Diagnosis by pulse. Glasgow University Library, MS Hunter 9, fol. 76r (15th c.). For a discussion of this illustration, see Loren C. MacKinney, *Medical Illustrations from Medieval Manuscripts*, pp. 16–17. By permission of the Librarian, Glasgow University Library.

the recipient of a continuous flow of celestial forces, either directly or through the surrounding air, and these influences affected temperament, health, and disease. Indeed, astrological influence was frequently invoked to explain major epidemics, such as the black death of 1347–51. Pressed for an explanation of this particular plague, the medical faculty at the University of Paris concluded that it resulted from corruption of the air caused by a conjunction of Jupiter, Saturn, and Mars in 1345.³¹

If illness struck, the physician needed to take account of the planetary configuration in order to prescribe effective treatment. Preparation and administration of drugs had to be properly timed to coincide with favorable planetary configurations, and proper dosage depended on astrological factors. It was also necessary to determine propitious times for surgical procedures,



Fig. 13.11. A physician's girdle book. London, Wellcome Institute Library. A handy guide for the physician, meant to be suspended from the belt. The left-hand illustration shows the book in its folded form. The right-hand illustration shows one of its leaves, this one containing astrological information. For a full discussion, see John E. Murdoch, *Album of Science: Antiquity and the Middle Ages*, pp. 318–19.

such as bloodletting. Surgical treatises often contained “bloodletting figures” that instructed the user on the appropriate times for bleeding from specific bleeding points. Finally, the Hippocratic theory of “critical days,” which held that the course of acute diseases is marked by crises or turning points, became linked to astrology; among the factors that were believed to determine the outcome of a crisis was its timing—whether or not it occurred on an astrologically favorable day.

ANATOMY AND SURGERY

Medieval healers were no doubt inclined toward moderate forms of medical intervention, such as control of diet and prescription of drugs. But some ailments and medical emergencies demanded more intrusive measures, and Europe always had medical practitioners willing to invade the body surgically. Many kinds of surgeons could be found, with differing specialties and levels of education, from itinerant empirics specializing in a particular surgical procedure to university-educated surgeons in the employ of king or pope. Surgery was customarily viewed as a craft, beneath the dignity of the university-educated physician; however, surgeons did manage to institutionalize their enterprise in southern European universities (Montpellier and Bologna, for example), thereby acquiring intellectual status. A substantial Arabic surgical literature was made available in the West through the translations of the twelfth and thirteenth centuries, and this stimulated a European tradition of surgical writing. Among the most influential of the European treatises were the *Surgery of Roger Frugard* (twelfth century), which frequently circulated in short sections, and the *Chirurgia magna* (or *Great Surgery*) of Guy de Chauliac (ca. 1290–ca. 1370), physician and surgeon to three popes. Guy's work not only circulated widely in Latin, but was also translated into English, French, Provençal, Italian, Dutch, and Hebrew.³²

Most surgery was not particularly heroic—the setting of a broken bone, reduction of a dislocated joint, dressing of an ulcer or sore, cleaning and suturing of a wound, or lancing of a boil. Bloodletting and cautery (application of hot irons to various parts of the body in order to create ulcers through which unwanted fluids could drain) were also common procedures.³³ Removal of external hemorrhoids may also have been fairly routine. But some medieval surgeons undertook much more ambitious procedures. Operation for removal of cataract, by inserting a sharp instrument through the cornea and forcing the lens of the eye out of its capsule and down to the bottom of the eye, is one example (fig. 13.12). Removal of bladder stone and surgical correction of hernia are others (fig. 13.13). The following text describes removal of a bladder stone:

If there is a stone in the bladder make sure of it as follows: have a strong person sit on a bench, his feet on a stool; the patient sits on his lap, legs bound to his neck with a bandage, or steadied on the shoulders of the assistants. The physician stands before the patient and inserts two fingers of his right hand into the anus, pressing with his left fist over the



Fig. 13.12 (*left*). Operation for cataract (above) and nasal polyps (below). Oxford, Bodleian Library, MS Ashmole 1462, fol. 10r (12th c.). For commentary on this figure, see Loren C. MacKinney, *Medical Illustrations from Medieval Manuscripts*, pp. 70–71.

Fig. 13.13 (*below*). Operation for scrotal hernia. Note that the patient is both tied and held down. Montpellier, Bibliothèque Inter-universitaire, Section Médecine, MS H.89, fol. 23r (14th c.). This illustration is discussed by Loren C. MacKinney, *Medical Illustrations from Medieval Manuscripts*, pp. 78–80.



patient's pubes. With his fingers engaging the bladder from above, let him work over all of it. If he finds a hard, firm pellet it is a stone in the bladder. . . . If you want to extract the stone, precede it with light diet and fasting for two days beforehand. On the third day, . . . locate the stone, bring it to the neck of the bladder; there, at the entrance, with two fingers above the anus incise lengthwise with an instrument and extract the stone.³⁴

As an example of dangerous surgery, fracture of the skull sometimes required trephining (the making of small holes in the skull with a saw) in order to reduce pressure and drain blood and pus. All surgeries were performed with only the most modest use of sedatives or anesthetics; if there was anything obviously heroic about medieval surgery, it was the patient.³⁵

How much human anatomy did the medieval surgeon or physician know, and what place did anatomical instruction and firsthand anatomical investigation have in the education of medical practitioners? Despite Galen's stress on the importance of anatomical knowledge for the successful treatment of disease, the connection between anatomical knowledge and the clinical side of medical practice remained as tenuous during the Middle Ages as it had been in antiquity. Most medieval practitioners no doubt found that they could get along quite nicely with a minimum of anatomical knowledge, for the advice they dispensed and the dietary and herbal remedies they prescribed rarely, if ever, depended on detailed structural knowledge of the human body. The surgeon's requirements were undoubtedly greater but still modest; much of the required knowledge was common property through such daily experience as animal butchery, and the rest could be obtained by experience in the course of apprenticeship or surgical practice.

Nonetheless, the translations of the twelfth century provoked new interest in anatomical questions. The translation of Galen's anatomical writings and Arabic works based on them (books by Avicenna, Haly Abbas, Rhazes, and later Averroes) brought to the West a body of anatomical literature that demanded attention—not because it promised a large, immediate impact on healing practices, but because it belonged to the body of medical theory that learned physicians considered their intellectual property. The new interest in anatomical knowledge first found expression in the form of actual anatomical dissections in twelfth-century Salerno. The object of dissection in this case was a pig, considered anatomically analogous to humans.

Human dissection appears to have begun in certain Italian universities, especially Bologna, late in the thirteenth century. The picture is murky, but the



Fig. 13.14. Human dissection. Paris, Bibliothèque Nationale, MS Fr. 218, fol. 56r (late 15th c.).

purpose seems originally to have been legal—autopsies within the law faculty for the purpose of determining the cause of death—the practice spreading subsequently, by steps we know nothing about, to include dissections for medical instruction. By 1316, Mondino dei Luzzi (d. ca. 1326), who taught at Bologna, had become sufficiently skilled in human dissection to write a dissection manual entitled *Anatomia*, which became the standard guide to human dissection for the next two centuries.³⁶

In the course of the fourteenth century, dissection became a regular part of medical instruction at Padua, Bologna, and a few other universities. In his *Chirurgia magna*, Guy de Chauliac described the procedures of his master at Bologna, Nicolaus Bertrucius:

Having laid the dead body on the table, he made four lessons on it. In the first the nutritive members [stomach and intestines] were treated, since they decay the soonest. In the second, the spiritual members [heart, lungs, and trachea], in the third the animal members [skull, brain, eyes,

and ears], and in the fourth the extremities were treated. And following the commentary on the book of *Sects* [of Galen], in each there are nine things to see: that is, to know the situation, the substance, the constitution, the number, the figure, the relations of connections, the actions and uses, and the diseases which affect them. . . . We perform anatomies also on bodies dried in the sun, or consumed in the earth, or submerged in running or boiling water. This reveals the anatomy at least of the bones, cartilage, joints, large nerves, tendons, and ligaments.³⁷

Such dissections were generally performed on the corpses of criminals, whose execution might be timed to meet the needs of the medical school. They were infrequent, an annual dissection being perhaps the most common pattern. And it is important to understand that the medical student was an observer rather than an experimenter; the function of dissection was to illustrate the Galenic text; this was not research, but pedagogy.³⁸

Older histories of medicine have often criticized medieval physicians for adopting a methodology that made texts, rather than cadavers, the primary anatomical authority. The unfortunate result of this methodology, it has been argued, was the continued propagation of a variety of errors in Galen's account of human anatomy. What are we to think of such criticisms? There is no question that medieval physicians found Galenic anatomy an awesome achievement and were therefore inclined to attach great (though not absolute) authority to Galenic texts, but it does not follow that they were fools. Consider a modern parallel: the modern anatomical textbook is also a remarkable achievement, and when a medical student taking the obligatory human anatomy course finds what appears to be a discrepancy between text and cadaver, he or she interprets this discrepancy as a variation in the cadaver rather than a mistake in the textbook. We should not be surprised to see medieval physicians and surgeons behaving similarly. They had every reason to believe that Galen had gotten it right (as, for the most part, he had) and to view the study of Galenic texts as the surest and most efficient, not to mention cleanest, way of acquiring anatomical knowledge.

Despite the secondary importance of anatomical dissection within medical education, we have seen that a tradition of anatomical dissection did develop late in the thirteenth and early in the fourteenth century. It grew in strength and sophistication over the next two hundred years, while maintaining a continuous dialogue with the textual tradition of anatomical knowledge. In the fifteenth century it became allied with the technology of printing, which made possible the cheap production of texts and the faithful reproduction of anatomical drawings. The quality of anatomical drawings was further enhanced

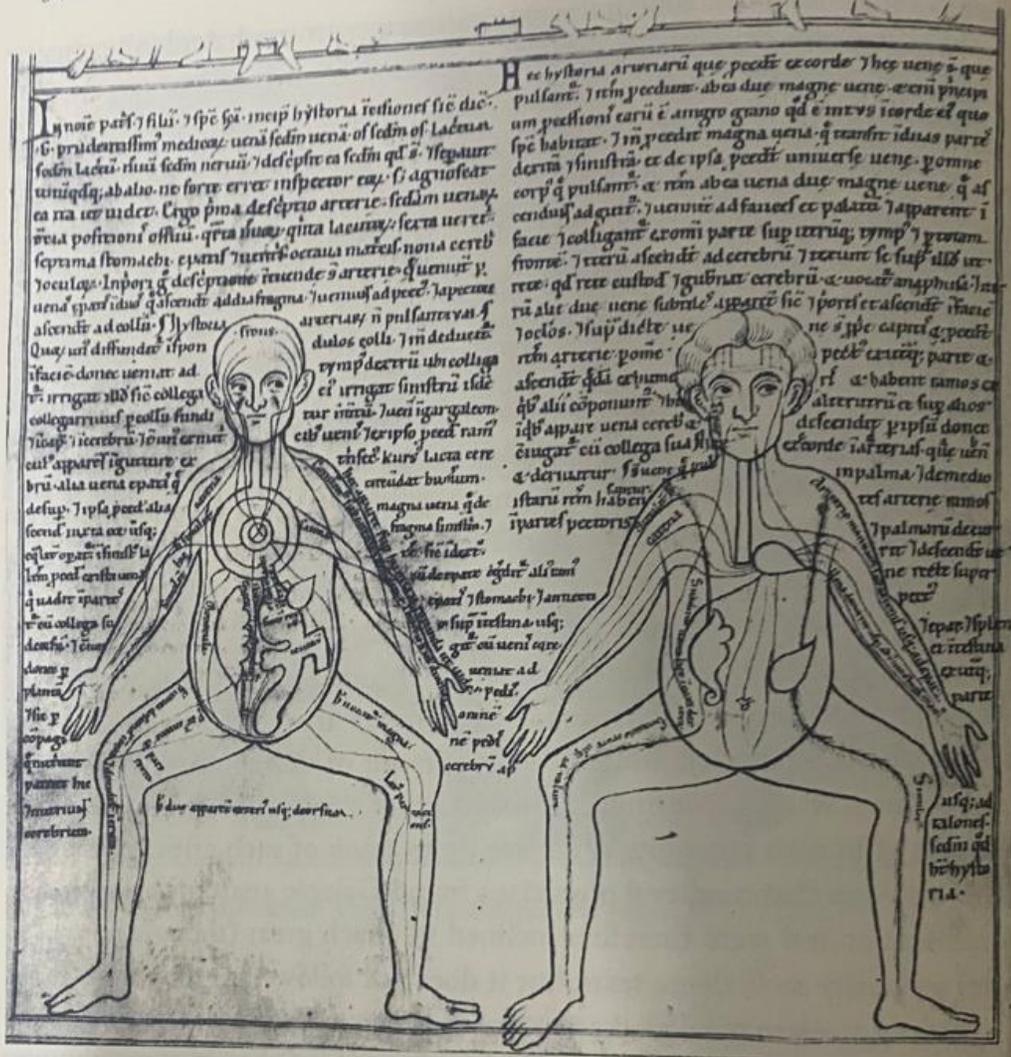


Fig. 13.15. Human anatomy, illustrating the Galenic conception of veins (left) and arteries (right). Munich, Bayerische Staatsbibliothek, CLM 13002, fol. 2v (12th c.). For commentary and additional anatomical drawings, see Siraisi, *Medieval and Early Renaissance Medicine*, pp. 92–95.

by contributions from the growing company of talented artists. And in the sixteenth century, these factors combined with renewed access to the Greek text of Galen to produce the stunning anatomical achievements of Andreas Vesalius (1514–64) and others.

DEVELOPMENT OF THE HOSPITAL

I conclude the discussion of medieval medicine on an institutional note, with a brief account of one of the most celebrated medieval medical achievements—the invention of the hospital. One of the difficulties in tracing the origin of the

hospital is deciding what the term means. If, by "hospital," we mean anything called "hospice" or "hospital," then we include many institutions that offered food and shelter to paupers and pilgrims, including the sick, but which provided little or no specialized medical care. If, however, we wish to reserve the term for institutions dedicated to the treatment of the sick, including the provision of skilled medical care, then we are applying a much more stringent criterion. The former sort of hospital, which was common throughout medieval Europe (often maintained by monasteries or communities of lay brethren), will not interest us. It is the latter kind of institution that will be the object of our attention.³⁹

Where, then, did the hospital as a medical institution come from? Its origins seem to lie in the Byzantine Empire, where, probably about the fourth century, ideals of Christian charity led to the establishment of hospitals that provided specialized medical care. One of the earliest for which we have hard evidence was the Sampson hospital (named after a saint of the fourth century) in Constantinople; here, early in the seventh century, for example, a church official suffering from a groin infection was hospitalized for surgery and convalescence. Other Byzantine hospitals were organized along the same lines: in the twelfth century, the Pantokrator hospital, also in Constantinople, had space for fifty patients (thirty-eight male and twelve female); to meet their medical and other needs, the hospital employed a staff of forty-seven, including physicians and surgeons.⁴⁰

This Byzantine model became known in both Islam and the West, where it interacted with, and helped to shape, indigenous traditions of health care. In Islam, we find comparable institutions early in the ninth century, perhaps owing to the influence of the Barmak family, which occupied a position of power under the caliph Hārūn al-Rashīd (786–809). No doubt there were many strands in the transmission of the Byzantine model to the West; one of them seems to have come as a by-product of the conquest of Jerusalem in 1099, during the First Crusade. Shortly after the fall of Jerusalem, the lay brothers (subsequently known as "Hospitallers") who operated the hospital of Saint John in Jerusalem reorganized it on the Byzantine model. Because of its prominent location and large size, it became renowned throughout Europe; visitors a century later reported that it housed a thousand patients or more. The Hospitallers eventually established a string of hospitals in Italy and southern France. Through the promulgation of various statutes regulating these hospitals (requiring, in one version, the hiring of four physicians to treat patients), the Jerusalem pattern became familiar in the West, where it influenced the conception of charitable care for the ill and the indigent, encouraging the development of the hospital as a specialized medical institution.⁴¹



Fig. 13.16. A medieval hospital. From Jean Henry, *Le livre de vie active des religieuses de l'Hôtel-Dieu* (late 15th c.). Paris, Centre de l'Image de l'Assistance Publique. This illustration is discussed by Marie-José Imbault-Huart, *La médecine au moyen âge*, p. 168.

This is, to be sure, a very sketchy picture, with many remaining uncertainties. Whatever the precise details of transmission and assimilation, the model of the hospital as a medical institution spread rapidly in the West in the twelfth and thirteenth centuries, to the point where hospitals could be found in cities and towns throughout Europe. They might be large or small, containing anywhere from hundreds of beds to half a dozen. Their sponsorship could be either religious or secular. Their clientele was principally from the lower classes, though there were exceptions. They were typically staffed by professional physicians who were paid an annual salary for their labors. Considerable thought was given to the needs of the patients—cleanliness and diet, for example. Beds consisted of straw mattresses suspended on ropes from bedposts, designed to hold two, or even three, patients. An account of medical facilities in Milan, written about 1288, is instructive:

In the city, including the suburbs . . . there are ten hospitals for the sick. . . . The principal one is the Hospital of the Brolo, very rich in

possessions, and founded by Geoffrey de Bussero in 1145. In it . . . are found, particularly in bad times, more than five hundred bed patients and as many more not lying down. All these receive food at the expense of the hospital itself. Besides them, there are 350 babies or more, placed with individual nurses after their birth, under the hospital's care. Every kind of poor person, except lepers, for whom another hospital is reserved, is received there, and kindly and bountifully restored to health, bed as well as food being provided. Also, all the poor needing surgical care are diligently cared for by three surgeons who are assigned to this particular task.⁴²

Though surely putting the best face on things, this account reveals the impressive level of care to which a medieval hospital might aspire.

NATURAL HISTORY

Medicine was no doubt the principal repository of biological knowledge during the Middle Ages, but it was not the only one. Aristotelian natural philosophy included a large component of zoological and botanical information. Encyclopedias almost always contained sections on plants and animals. Herbals and bestiaries specialized in the plant and animal kingdoms, respectively. And finally, medieval people had intimate firsthand knowledge of the local flora and fauna. This chapter will conclude with a brief examination of medieval botanical and zoological knowledge.

Medieval botanical knowledge was closely linked with medicine, since the principal use of plants (if we ignore those that formed part of the European diet) was in herbal remedies. If the medicinal use of herbs was to be effective, manuals were needed, which would describe the various herbs and their therapeutic uses. A significant herbal literature thus developed, most of it designed for practical purposes. The model was Dioscorides' *De materia medica*, in its revised Latin translation, which arranged medicinal substances in alphabetical order so as to facilitate use. A typical entry in an herbal would include the name or names of the plant, an account of its identifying features, including habitat, a description of the medicinally significant parts and their therapeutic properties, and instructions regarding preparation and use. The alphabetical arrangement of the herbal reveals that practical aims (the ability to look up a medicinal substance by name) prevailed over classification according to biological type or any other theoretical consideration.⁴³

But alongside these practically oriented herbals, there was also a more theoretical or philosophical literature that placed plant life within the context

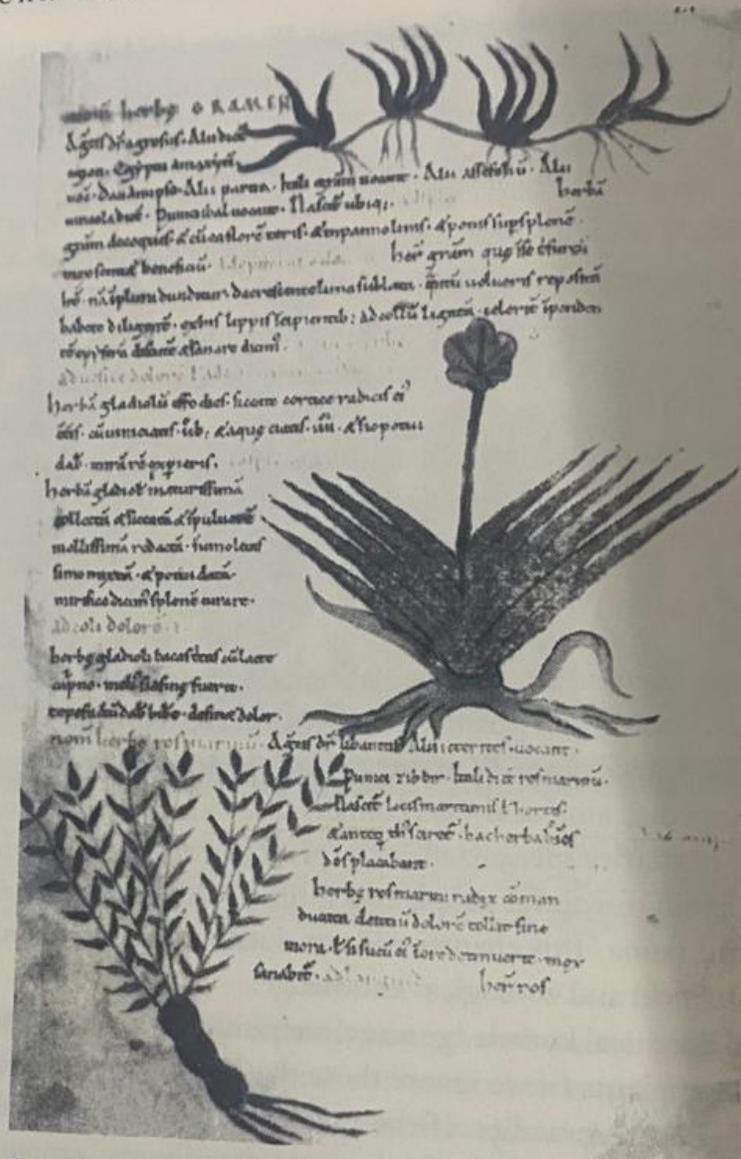


Fig. 13.17. A page from the *Herbal of Pseudo-Apuleius*, describing and illustrating couchgrass, sword lily, and rosemary. Oxford, Bodleian Library, MS Ashmole 1431, fol. 21r (12th c.). Described in Joan Evans, ed., *The Flowering of the Middle Ages*, pp. 190, 352.

of natural philosophy. Most of this literature descended in one way or another from the book *On Plants*, attributed to Aristotle and believed by medieval scholars to be his, but probably written by Nicholas of Damascus (1st century B.C.). A few commentaries were written on this treatise (perhaps a dozen are known), by far the most impressive of which was *On Vegetables* by Albert the Great (ca. 1200–1280). Albert's *On Vegetables* contains a paraphrase of *On Plants*, accompanied by Albert's own attempt to bring intellectual order to the

natural philosophy of plants, and a concluding alphabetical list of herbs and their uses. A reading of this work reveals the extraordinary skill, unmatched by any contemporary, with which Albert observed and described botanical phenomena.⁴⁴

One might expect close parallels between botanical and zoological literature. However, zoological knowledge had few applications in the medical realm and little practical value elsewhere; and consequently, there was no zoological counterpart of that repository of practical botanical knowledge—the herbal. As in the case of botany, there was an underlying Aristotelian textual tradition, for Aristotle had written a series of large and important zoological works. These were rendered into Latin (along with an influential commentary by Avicenna) and attracted considerable attention—not so much for the detailed zoological information they contained as for their bearing on more general issues in natural philosophy. Once again Albert the Great was one of the major figures, producing, in his massive *On Animals* (occupying more than 1,800 pages in modern English translation) and other works, a large body of descriptive and theoretical zoology. Of particular interest are his discussions of nutrition and embryology. His treatment of conception and embryological development, for example, was dependent not only on Aristotle's theories of conception, but to a very substantial degree on his own observations of the reproductive behavior of animals. The history of medieval zoology has yet to be written, but in Albert the Great we undoubtedly see the philosophical side near its zenith.⁴⁵

Besides zoological works in the Aristotelian tradition, there were various other genres of literature on animals—two of which have attracted considerable attention. One of these consists of practical treatises on falconry. The most famous of the genre was written in Sicily by Emperor Frederick II (about the middle of the thirteenth century) and titled *On the Art of Hunting with Birds*. The most famous observation in this most famous treatise on birds is Frederick's experimental determination that vultures locate their food by sight rather than by smell—ascertained by observing their inability to find food when their eyes were covered.⁴⁶

If Frederick's treatise on falconry seems remarkably practical and modern, devoid of the fanciful or metaphysical content that we have come to associate with the Middle Ages, our final example of medieval literature on animals goes to the other extreme. The medieval bestiary is often presented as an example of medieval inability to observe the world objectively and get zoological knowledge straight. Medieval bestiaries are all descended from an anonymous treatise entitled *Physiologus*, emanating from Alexandria and

written originally in Greek (perhaps about the year A.D. 200), subsequently translated into Latin and all of the major European vernacular languages. The *Physiologus* and the medieval books inspired by it are collections of animal lore arranged in short entries or chapters under the names of the respective animals—numbering from about forty in the *Physiologus* to more than a hundred in some of the later bestiaries.⁴⁷

ETIMOLOGIA
DIAGNOSIS
HISTORIA

The typical entry in a bestiary begins with an etymological explanation of the animal's name. For example, "the vulture is thought to have been named for its slow flight [*a volatu tardo*]." If the animal has distinctive physical characteristics, these will be reported next, followed by an account of unusual or interesting behavior and a description of admirable and regrettable character traits. From this same twelfth-century bestiary, we learn that the hedgehog is covered with spikes and curls itself into a ball for protection; that the fox is a "fraudulent and ingenious animal" that plays dead in order to catch its prey; that cranes move about in military formation; that the serpent called "basilisk" can kill with the power of its glance; that the lynx's urine turns into a precious stone; that lions are compassionate and courageous, and that their eyebrows and manes offer a clue to their disposition. Finally, many (but not all) entries go on to draw a moral or make a theological point on the basis of the animal description. The hedgehog is an example of prudence, the crane of courtesy and responsibility. The fox is employed as a type of the devil, who entices carnal man through fraudulent behavior. And the male lion, breathing life into its stillborn offspring after three days, represents God the Father raising Christ from the dead.⁴⁸

How are we to judge such an odd mixture of fact, fancy, and parable? The bestiary certainly does not read like a modern zoology manual, and on this basis interested parties have sometimes portrayed the people who compiled the bestiaries as incompetent or unsuccessful zoologists. The assumption is that they were trying (or should have been trying) to write modern zoology manuals but could not figure out how to do it; and their most serious deficiency was their apparent inability to distinguish between fact and fancy. But it is, of course, ridiculous to insist that medieval people share our interests and priorities. That medieval scholars were capable of writing something rather like a zoology manual is clear enough from the analogous case of the herbal or from the books on falconry that we have touched upon. And their failure to make the bestiary into a zoological manual must, therefore, derive from the adoption of different aims.

What purpose, then, was the bestiary meant to serve? It was a collection of animal lore and mythology, rich in symbolism and associations, meant to

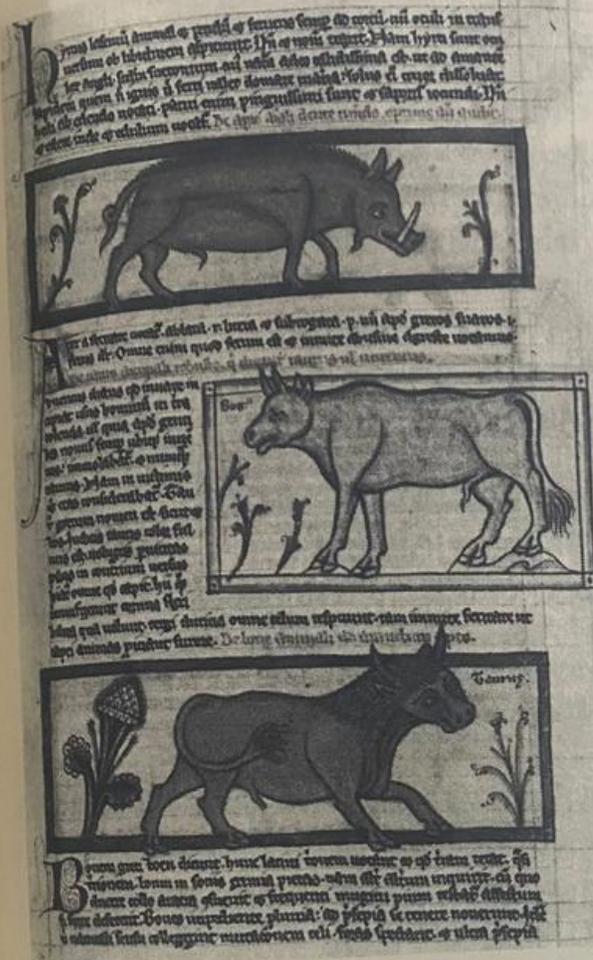


Fig. 13.18. A page from a medieval bestiary, showing boar, ox, and bull. London, British Library, MS Harley 3244, fol. 47r (early 13th c.). By permission of the British Library.

instruct and entertain. And it surely did not occur, either to the compiler or to the reader, to inquire whether the stories were true in the sense that the claims of Aristotelian natural philosophy were expected to be true. A bestiary succeeded insofar as it effectively brought its reader into a world of traditional mythology, metaphor, and similitude.⁴⁹ We have similar mythologies of our own. Consider the lore surrounding the groundhog as a forecaster of the duration of winter, solemnly reported each February (at least in my part of the country) in newspapers and on radio and television. Does anybody believe in the truth of this forecast? Probably not; but to ask the question is to display a woeful misapprehension of the purpose of groundhog lore, which is not the “scientific” communication of meteorological truth, but participation in traditional community ritual, with all of the social and psychological benefits thus entailed.

Most of us become quite skillful at discriminating among different kinds of literary and artistic products in our own culture. We immediately know the

difference between a scientific proposition, which must meet a variety of stiff epistemological tests in order to count as truly "scientific," and a Dr. Seuss story or a weather forecast offered to us by Jimmy the groundhog, which have quite different functions and must therefore be measured by different criteria. We need to become equally discerning in our study of medieval people and their achievements, including the various genres of art and literature that they produced. Just as we have seen (chap. 11, above) that the medieval mappamundi generally had purposes quite different from those of a modern world atlas, so must we cease to presume that all medieval books that touch on natural phenomena were meant for philosophical or scientific purposes analogous to ours when we write a scientific textbook, and to understand that they may have been meant to please and inform their readers on a variety of other levels. As we acquire this kind of sophisticated discernment of the products of medieval culture, learning to judge the achievement in the light of the aim, we will be on our way to a fuller appreciation of the character, the achievements, and, yes, the charm of the Middle Ages.